

Application/Control Number : 09/423,544
Art Unit: 2834 - Examiner: LAM, T
October 19, 2001
Page 12

Remarks

It is observed that the Examiner rejected claims 24-25 and 46 as being anticipated by Marioni (US-4,861,240) while considered claims 27-28, 31-41 and 43-45 as being allowable if rewritten in independent form.

Accordingly, the applicant has amended claims 24, 28, 29, 32, 35 and 40. The amended claim 24 now includes all the features of previous claims 24, 25 and 27. Claims 25-27 have been deleted.

The new independent claim 24 is believed to be in an allowable condition since it clearly defines the peculiarities of the invention.

The applicant has also drafted a new set of claims 47- 69 in which the new independent claim 47 recites that "..... a resulting angle, which constitutes a free angle of rotation, being given by a sum of the angles of each coupling". This means that the free angle of rotation, the obtainment of which is one of the objects of the invention, is given by the sum of the angle of rotation of each of the couplings.

The present invention provides in fact the great advantage that the angle of rotation is not limited to the sum of the free angles of rotation that would be obtainable by combining prior art documents '425 and '240. In fact, if one combined the teachings of those two documents, he would end up having a free angle of rotation given by the sum of the angle of the impeller (document '240) and the angle at the end of the axis of the device of document '425. However, if the resulting angle were not sufficient, the combination of the two documents does not give any hint about a possible solution to obtain a still larger angle.

The solution is provided by the present invention and is given by coupling together a plurality of motion transmission couplings, each coupling having a respective free angle of rotation, the resulting free angle of rotation being given by the sum of the

C

Application/Control Number : 09/423,544
Art Unit: 2834 - Examiner: LAM, T
October 19, 2001
Page 13

respective free angles of rotation. Accordingly, one can choose the desired angle of rotation by coupling together a suitable number of motion transmission couplings.

Accordingly, independent claim 47 is also believed to be in an allowable condition and allowance thereof is respectfully requested.

It will be noted that a sincere effort has been made to positively respond to all of the points raised by the Examiner.

While it is believed that the amended claims properly define the present invention and distinguish the same over the art of record, applicant would be open to any suggestion the Examiner may have concerning different claim phraseology which, in the Examiner's opinion, more accurately defines the present invention.

Respectfully submitted,



Guido MODIANO (Reg. No. 19,928)
Agent for the Applicant

Date: October 19, 2001
Address: Via Meravigli 16, 20123 MILAN-ITALY
Telephone: (from USA) (011)(39)(02)8590-7777
Telefax: (from USA)(011)(39)(02)863-860

C

Application/Control Number : 09/423,544
Art Unit: 2834 - Examiner: LAM, T
October 19, 2001
Page 3

In the Claims

✓ Twice amend claims 24, 28, 29, 32, 35 and 40 as follows, cancel without prejudice claims 25-27 and add the following new claims 47-69.

24. [Twice amended] A device for transmitting motion between the rotor of a synchronous permanent-magnet motor and the working part, comprising at least two motion transmission couplings which mutually cooperate in a kinematic series, each coupling being constituted by at least one driving element which is eccentric with respect to the rotation axis and is rigidly coupled to a component of the motion transmission system and by at least one driven element, which is also eccentric with respect to the rotation axis and is rigidly coupled to the component arranged kinematically after the preceding one, the angle covered by the elements of each coupling being, as a whole, less than a round angle, the intermediate components of the kinematic transmission having both a driven element and a driving element for receiving the motion from a preceding one and transmitting it to a subsequent one, wherein said motion transmission couplings are toothed, a first one of said couplings being constituted by two first teeth which are rigidly coupled to the rotor of a motor in diametrically opposite positions, and of two second teeth which are rigidly coupled likewise in diametrically opposite positions, to an annular element which can rotate freely with respect to said rotor, a second one of said couplings being composed of said second teeth and of two third teeth which are also diametrically opposite and are rigidly coupled to the working part.

28. [Twice amended] The device according to claim [25] 24, comprising four couplings which mutually cooperate in a kinematic series, a first one of said couplings being constituted by a first tooth which is rigidly coupled to the free shaft of a motor and of a second tooth which is rigidly coupled to an annular element which can rotate freely with respect to said free shaft, a second one of said couplings being composed of said second tooth and of a third tooth which is rigidly coupled to the working part, a third one of said couplings being composed of a fourth tooth which is rigidly coupled

C

Application/Control Number : 09/423,544
Art Unit: 2834 - Examiner: LAM, T
October 19, 2001
Page 4

to the rotor of said motor and of a fifth tooth which is rigidly coupled to an annular element which moves freely with respect to said free axis, a fourth one of said couplings being composed of said fifth tooth and of a sixth tooth which is rigidly coupled to said free shaft.

29. [Twice amended] The device according to claim [26] 24, wherein said motion transmission couplings are arranged in an axial hollow body which is rigidly coupled to said working part and is closed by a cover.

32. [Twice amended] The device according to claim [26] 24, wherein said motion transmission couplings comprise a first tooth which is rigidly coupled to an axial tang which protrudes from a tip flange of said rotor, said annular element from which said second tooth protrudes being arranged so as to surround said shaft and so that it can rotate freely, the extension of said second tooth being such that it can make contact with said first tooth and with said third tooth which protrudes from another annular element which is rigidly coupled to said shaft.

35. [Twice amended] The device according to claim [27] 24, wherein said couplings are arranged in an axial hollow body which is rigidly coupled to said working part and is closed hermetically by a cover.

40. [Twice amended] The device according to claim [25] 24, wherein at least one of said teeth is composed of an internal supporting part which is made of rigid plastics and of two mutually opposite external parts which are overmolded on the internal part, are made of elastomeric material, and form the surfaces for contact with the other teeth.

47. A device for transmitting motion between the rotor of a synchronous permanent-magnet motor and the working part, comprising at least two motion transmission couplings which mutually cooperate in a kinematic series, each coupling being constituted by at least one driving element which is eccentric with respect to the rotation axis and is rigidly coupled to a component of the motion transmission system and by at least one driven element, which is also eccentric with respect to the rotation axis and is rigidly coupled to the component arranged kinematically after the preceding one, the angle covered by the elements of each coupling being, as a whole, less than a round angle, the intermediate components of the kinematic transmission having both a

Application/Control Number : 09/423,544
Art Unit: 2834 - Examiner: LAM, T
October 19, 2001
Page 5

C5
cont.

driven element and a driving element for receiving the motion from a preceding one and transmitting it to a subsequent one, a resulting angle, which constitutes a free angle of rotation, being given by a sum of the angles of each coupling.--

--48. The device according to claim 47, wherein said motion transmission couplings are toothed, each coupling being constituted by at least one driving tooth, which is eccentric with respect to the rotation axis and is rigidly coupled to a component of the motion transmission system, and by at least one driven tooth, which is also eccentric with respect to the rotation axis and is rigidly coupled to the component that kinematically follows the preceding one.--

--49. The device according to claim 48, wherein two couplings which mutually cooperate in a kinematic series, a first one of said couplings being constituted by a first tooth which is rigidly coupled to the rotor of a motor and by a second tooth which is rigidly coupled to an annular element which can rotate freely with respect to said rotor, a second one of said couplings being composed of said second tooth and a third tooth which is rigidly coupled to the working part.--

--50. The device according to claim 48, wherein two couplings which mutually cooperate in a kinematic series, a first one of said couplings being constituted by two first teeth which are rigidly coupled to the rotor of a motor in diametrically opposite positions, and of two second teeth which are rigidly coupled, likewise in diametrically opposite positions, to an annular element which can rotate freely with respect to said rotor, a second one of said couplings being composed of said second teeth and of two third teeth which are also diametrically opposite and are rigidly coupled to the working part.--

--51. The device according to claim 48, comprising four couplings which mutually cooperate in a kinematic series, a first one of said couplings being constituted by a first tooth which is rigidly coupled to the free shaft of a motor and of a second tooth which is rigidly coupled to an annular element which can rotate freely with respect to said free shaft, a second one of said couplings being composed of said second tooth and of a third tooth which is rigidly coupled to the working part, a third one of said couplings being composed of a fourth tooth which is rigidly coupled to the rotor of said motor

C

Application/Control Number : 09/423,544
Art Unit: 2834 - Examiner: LAM, T
October 19, 2001
Page 6

C5
cont.

and of a fifth tooth which is rigidly coupled to an annular element which moves freely with respect to said free axis, a fourth one of said couplings being composed of said fifth tooth and of a sixth tooth which is rigidly coupled to said free shaft.--

--52. The device according to claim 49, wherein said motion transmission couplings are arranged in an axial hollow body which is rigidly coupled to said working part and is closed by a cover.--

--53. The device according to claim 52, wherein said first tooth protrudes from a tang which is keyed on the end of said shaft, said first tooth being arranged eccentrically with respect to said shaft and constituting a driving tooth for said second tooth which protrudes axially from an annular element which can rotate freely in said hollow body with respect to said shaft and to said hollow body, said second tooth having an extension which allows it to make contact with said first tooth and with said third tooth which protrudes from the internal wall of the hollow body.--

--54. The device according to claim 53, wherein said first tooth has a radial extension which partially affects the internal space of said hollow body, the radial extension of said second tooth affecting the region between said tang and the external wall of said hollow body, providing clearances which allow free movement, said second tooth having an axial extension which allows it to make contact with said first tooth and with said third tooth, said third tooth protruding radially from the internal wall of said hollow body to the vicinity of the external profile of said first tooth.--

--55. The device according to claim 49, wherein said motion transmission couplings comprise a first tooth which is rigidly coupled to an axial tang which protrudes from a tip flange of said rotor, said annular element from which said second tooth protrudes being arranged so as to surround said shaft and so that it can rotate freely, the extension of said second tooth being such that it can make contact with said first tooth and with said third tooth which protrudes from another annular element which is rigidly coupled to said shaft.--

--56. The device according to claim 55, wherein the axial extension of said first tooth partially affects the extension of said tang, the remaining part being affected by said annular element, from which said second tooth protrudes.--

C

Application/Control Number : 09/423,544
Art Unit: 2834 - Examiner: LAM, T
October 19, 2001
Page 7

C5
cont.
--57. The device according to claim 55, wherein said third tooth occupies the radial space provided externally with respect to said first tooth.--

--58. The device according to claim 50, wherein said couplings are arranged in an axial hollow body which is rigidly coupled to said working part and is closed hermetically by a cover.--

--59. The device according to claim 58, wherein said two first teeth protrude in a diametrically mutually opposite configuration from a first annular element which is keyed to the shaft of a motor, said first teeth radially and partially affecting the space inside said hollow body, said first teeth constituting driving teeth for said two second teeth which protrude axially from a second annular element which can rotate freely in said hollow body with respect to said shaft and to said hollow body, said second teeth having an extension which allows them to make contact also with two third teeth which protrude radially from the internal wall of said hollow body in the region left free by said first teeth.--

--60. The device according to claim 59, wherein said first teeth are arranged in axially offset positions and in that said second teeth are shaped so as to have parts whose radial extension affects all of the region between said tang and the external wall of the hollow body, providing clearances which allow free movement, said second teeth having an axial extension which allows them to make contact with said first teeth and with said third teeth which protrude radially from the internal wall of said hollow in axially offset positions.--

--61. The device according to claim 51, wherein two of said four motion transmission couplings are arranged in an axial hollow body which protrudes from said working part toward said rotor and is closed by a cover.--

--62. The device according to claim 61, wherein said first tooth protrudes from a tang which is keyed to the end of said free shaft, said first tooth being arranged eccentrically with respect to said shaft and constituting a driving tooth for said second tooth which protrudes axially from an annular element which can rotate freely in said hollow body with respect to said shaft and said hollow body, said second tooth having an extension which allows it to make contact with said first tooth and with said third

C

Application/Control Number : 09/423,544
Art Unit: 2834 - Examiner: LAM, T
October 19, 2001
Page 8

C5
cont.

tooth which protrudes from the internal wall of the hollow body, the other two of said four motion transmission couplings comprising said fourth tooth, which is rigidly coupled to an axial tang which protrudes from a tip flange of the rotor of said motor, so as to surround said free shaft, said annular element from which said fifth tooth protrudes being arranged so that it can rotate freely, the extension of said fifth tooth being such that it can make contact with said fourth tooth and with said sixth tooth which protrudes from another annular element which is rigidly coupled to said shaft.--

--63. The device according to claim 48, wherein at least one of said teeth is composed of an internal supporting part which is made of rigid plastics and of two mutually opposite external parts which are overmolded on the internal part, are made of elastomeric material, and form the surfaces for contact with the other teeth.--

--64. The device according to claim 50, wherein said cover closes said hollow body so that a hermetic seal is provided therein.

--65. The device according to claim 47, wherein a slight interference is provided between the mutually moving parts, producing a friction engagement.--

--66. The device according to claim 50, wherein in said hollow body there is a viscous fluid which has lubricating, impact-damping and noise-deadening functions.--

--67. The device according to claim 51, wherein said first tooth protrudes from a tang which is keyed to the end of said shaft, said first tooth being arranged eccentrically with respect to said shaft and constituting a driving tooth for said second tooth which protrudes axially from an annular element which can rotate freely in said hollow body with respect to said shaft and to said hollow body, said second tooth having an extension which allows it to make contact with said first tooth and with said third tooth which protrudes from the face of said cover which is directed toward the inside of the hollow body.--

--68. The device according to claim 67, wherein said first tooth has a radial extension which partially affects the internal space of said hollow body, the radial extension of said second tooth affecting the region between said tang and the external wall of said hollow body, providing clearances which allow free movement, said second tooth having an axial extension which allows it to make contact with said first

C

Application/Control Number : 09/423,544
Art Unit: 2834 - Examiner: LAM, T
October 19, 2001
Page 9

C5
cancel

tooth and with said third tooth, said third tooth protruding radially from a position which is proximate to the external profile of the cover to the vicinity of the external profile of said annular element.--

--69. The device according to claim 47, wherein said working part is an impeller with curved vanes of a centrifugal pump.--

C